REMARKS

Claims 1 - 10 are pending in the present application. By this Amendment, claims 1-4 and 6-9 have each been amended and claims 5 and 10 have been cancelled. No new matter has been added. It is respectfully submitted that this Amendment is fully responsive to the Office Action dated January 25 2005.

Examiner Interview:

The courtesies extended by Examiner Chang and Supervisory Patent Examiner Knight to applicant's representative, Tom Brown, during the June 1, 2005 telephone interview are gratefully appreciated. The substance of such interview is incorporated into the following remarks.

Specification:

The specification has been amended to correct a minor informality. More specifically, the phrases "$x_M = (r\cos\kappa\omega t + \eta r\cos\omega t)^{1/2}$" and "$y_M = (r\sin\kappa\omega t + \eta r\sin\omega t)^{1/2}$ in lines 17 and 18 of page 22 of the present specification have been changed to "$x_M = r\cos\kappa\omega t + \eta r\cos\omega t$" and "$y_M = r\sin\kappa\omega t + \eta r\sin\omega t$" respectively.

It is submitted, with reference to Fig. 42, that it is easy for one skilled in the art to understand that the above-mentioned phrases were merely mis-typewritten.

As to the Merits:

As to the merits of this case, the Examiner relies on the newly cited reference of <u>Kimura</u>

(JP 406304805) in setting for the following rejection.

Claims 1-10 are rejected under 35 USC 103(a) as being unpatentable over <u>Kimura</u> (JP

406304805) in view of <u>David P. Little</u> (SpiroGraph, http://www.math.dartmounth.edu/-

dlittle/java/SpiroGraph/, 1997.

This rejection is respectfully traversed.

It is submitted that the constructional elements relating to the function f(θ) being added

to the amended claims is supported by the discussion in lines 2-15, page 24 of the present

specification.

In <u>Little</u> (Spiro Graph) (Page 1 of 4, <u>Little</u>), there are formulas as follows:

$x(t)=(R+r)\cos(t)-p*\cos((R+r)t/r)$

$y(t)=(R+r)\sin(t)-p*\sin((R+r)t/r)$

The above-mentioned formulas define a "cycloid".

As mentioned above with regard to the lines 17 and 18 of page 22 of the present

specification, there are formulas indicating a "cycloid" in the present application.

However, in the present invention, there are some features which are necessary for determining a contour of a regular N-polygonal figure for a boring hole.

Independent Claim 1:

In the invention of amended claim 1, such features are as follows:

1-(1) "the second point (M) is away from the first point (E) by a distance $(N-1)^2r$";

1-(2) "the locus of the second point (M) defines a contour of a regular N-polygonal figure to be determined being circumscribed on a circle having a radius $N(N-2)r$";

1-(3) "the contour of the regular N-polygonal figure can be defined by a function $f(\theta)$";

1-(4) "the function $f(\theta)$ is a one-valued function; the function $f(\theta)$ is a periodic function with a period $2\pi/N$",

1-(5) "the function $f(\theta)$ has one maximum value and one minimum value in one period";

1-(6) "the function $f(\theta)$ has line symmetry with respect to the center of the minimum point between the two maximum points, in regard to one period from a maximum point to the next maximum point of the function $f(\theta)$"; and

1-(7) "the function $f(\theta)$ has a positive curvature or no curvature".

It appears that the examiner insists that the above-mentioned features 1-(1) and 1-(2) are suggested in the area "Rounded Square" in Little.

However, conditions shown in the area "Rounded Square", that is, Radius 1 is 60, Radius 2 is –45, Position is –101 and Resolution is 270 do <u>not</u> correspond to the above-mentioned features 1-(1) and 1-(2).

Additionally, in the specification of the present application, there is <u>not</u> a description relating to the parameter "Resolution" written in <u>Little</u>. Therefore, it is obvious that the mechanism of the invention of the claim 1 is different from the mechanism of <u>Little</u>.

Moreover, it is impossible for the skilled in the art to introduce the above-mentioned features 1-(1) to 1-(7) from the formulas written in <u>Little</u> which define a "cycloid".

Especially, since <u>Little</u> does <u>not</u> indicate that the contour of the regular N-polygonal figure can be defined by a function, nobody could introduce the features 1-(3) to 1-(7) from <u>Little</u>.

Also, <u>Kimura</u> (JP 06304805 A) does <u>not</u> indicate the above-mentioned features 1-(1) to 1-(7).

Therefore, it is impossible for the skilled in the art to create the invention of amended claim 1 from <u>Little</u> and <u>Kimura</u>.

Independent Claim 2:

In the invention of the amended claim 2, there are constructional elements as follows;

2-(1) "a contour of the said regular (N-1)-polygonal figure is inscribed on a circle having a radius $(N-1)^2 r$";

2-(2) "the regular (N-1)-polygonal figure revolves at an angular velocity $(1-N)\omega$";

2-(3) "an area being swept by the said regular (N-1)-polygonal figure defines a regular N-polygonal figure to be determined, which figure is circumscribed on a circle having a radius $N(N-2)r$"; and

the above-mentioned constructional elements 1-(3) to 1-(7).

In Little and Kimura, there are no descriptions which suggest the constructional elements 2-(1) to 2-(3) and 1-(3) to 1-(7).

Since Little does not indicate that the contour of the regular N-polygonal figure can be defined by a function, nobody could introduce the features 1-(3) to 1-(7) from Little.

It appears that the examiner insists that the above-mentioned features 2-(1) to 2-(3) are suggested in the area "Rounded Square" in Little.

However, conditions shown in the area "Rounded Square", that is, Radius 1 is 60, Radius 2 is –45, Position is –101 and Resolution is 270 do not correspond to the above-mentioned features 2-(1) to 2-(3).

Additionally, in the specification of the present application, there is <u>not</u> a description relating to the parameter "Resolution" written in <u>Little</u>. Then, it is obvious that the mechanism of the invention of the claim 1 is different from the mechanism of <u>Little</u>.

Therefore, it is impossible for the skilled in the art to create the invention of amended claim 2 from <u>Little</u> and <u>Kimura</u>.

<u>Independent Claim 3</u>:

In the invention of the amended claim 3, there are constructional elements as follows;

3-(1) "a regular (N+1)-polygonal figure revolves along a circle, which circle is concentric to the center of a regular N-polygonal figure to be determined and has a radius r, and rotates at an angular velocity ω ";

3-(2) "a contour of the said regular (N+1)-polygonal figure is inscribed on a circle having a radius $(N+1)^2r$ ";

3-(3) "the regular (N+1)-polygonal figure revolves at an angular velocity $(N+1)\omega$ ";

3-(4) "an area being swept by the said regular (N+1)-polygonal figure defines a regular N-polygonal figure to be determined, which figure is circumscribed on a circle having a radius N(N+2)r"; and

the above-mentioned constructional elements 1-(3) to 1-(7).

In <u>Little</u> and <u>Kimura</u>, there are no descriptions which suggest the constructional elements 3-(1) to 3-(4) and 1-(3) to 1-(7).

Since <u>Little</u> does <u>not</u> indicate that the contour of the regular N-polygonal figure can be defined by a function, nobody could introduce the features 1-(3) to 1-(7) from <u>Little</u>.

<u>Kimura</u> does <u>not</u> indicate a method for determining a regular N-polygonal figure by means of a regular (N+1)-polygonal figure.

It appears that the examiner insists that the above-mentioned features 3-(1) to 3-(4) are suggested in the area "Rounded Square" in <u>Little</u>.

However, conditions shown in the area "Rounded Square", that is, Radius 1 is 60, Radius 2 is –45, Position is –101 and Resolution is 270 do <u>not</u> correspond to the above-mentioned features 3-(1) to 3-(4).

Additionally, in the specification of the present application, there is <u>not</u> a description relating to the parameter "Resolution" written in <u>Little</u>. Therefore, it is obvious that the mechanism of the invention of the claim 3 is different from the mechanism of <u>Little</u>.

It is impossible for the skilled in the art to create the invention of amended claim 3 from <u>Little</u> and <u>Kimura</u>.

Independent Claim 4:

In the invention of the amended claim 4, there are constructional elements as follows;

4-(1) "setting a ratio of the distance between the center point and the first point to the length of a line segment connecting the first and second points being smaller than $(N-1)^2$";

4-(2) "defining a figure to be determined by the locus of the second point, which figure has vertexes of N in number, is circumscribed on a circle having a radius $N(N-2)r$, and is a single closed region formed by curves"; and

the above-mentioned constructional elements 1-(3) to 1-(7).

In Little and Kimura, there are no descriptions which suggest the constructional elements 4-(1) and 4-(2) and 1-(3) to 1-(7).

Since Little does not indicate that the contour of the regular N-polygonal figure can be defined by a function, nobody could introduce the features 1-(3) to 1-(7) from Little.

It appears that the examiner insists that the above-mentioned limitations 4-(1) and 4-(2) are suggested in the area "Rounded Square" in Little.

However, conditions shown in the area "Rounded Square", that is, Radius 1 is 60, Radius 2 is –45, Position is –101 and Resolution is 270 do not correspond to the above-mentioned features 4-(1) and 4-(2).

Additionally, in the specification of the present application, there is <u>not</u> a description relating to the parameter "Resolution" written in <u>Little</u>. Therefore, it is obvious that the mechanism of the invention of the claim 1 is different from the mechanism of <u>Little</u>.

It is impossible for the skilled in the art to create the invention of amended claim 4 from <u>Little</u> and <u>Kimura</u>.

Independent Claim 6:

In the invention of the amended claim 6, there are constructional elements as follows;

6-(1) "the said input means is constructed to carry out functions for" "setting a distance $(N-1)^2r$ between the second point and the first point";

6-(2) "said control means is constructed so as to carry out functions for defining a regular N-polygonal figure to be determined by the locus of the second point, which figure is circumscribed on a circle having a radius $N(N-2)r$"; and

the above-mentioned constructional elements 1-(3) to 1-(7).

In <u>Little</u> and <u>Kimura</u>, there are <u>no</u> descriptions which suggest the constructional elements 6-(1) and 6-(2) and 1-(3) to 1-(7).

Since <u>Little</u> does not indicate that the contour of the regular N-polygonal figure can be defined by a function, nobody could introduce the features 1-(3) to 1-(7) from <u>Little</u>.

It appears that the examiner insists that the above-mentioned features 6-(1)and 6-(2) are suggested in the area "Rounded Square" in <u>Little</u>.

However, conditions shown in the area "Rounded Square", that is, Radius 1 is 60, Radius 2 is –45, Position is –101 and Resolution is 270 do not correspond to the above-mentioned featrues 6-(1)and 6-(2).

Additionally, in the specification of the present application, there is <u>not</u> a description relating to the parameter "Resolution" written in <u>Little</u>. Therefore, it is obvious that the mechanism of the invention of the claim 6 is different from the mechanism of <u>Little</u>.

It is impossible for the skilled in the art to create the invention of amended claim 6 from <u>Little</u> and <u>Kimura</u>.

<u>Independent Claim 7</u>:

In the invention of the amended claim 7, there are constructional elements as follows;

7-(1) "said input means is constructed to carry out functions for"" setting the regular (N-1)-polygonal figure so as to define a contour which is inscribed on a circle having a radius (N-1)^{2}r";

7-(2) "setting an angular velocity (1-N)ω at which the regular (N-1)-polygonal figure revolves";

7-(3) "said control means is constructed to carry out a function for defining a regular N-polygonal figure to be determined, which is circumscribed on a circle having a radius N(N-2)r, by an area being swept by the regular (N-1)-polygonal figure"; and

the above-mentioned constructional elements 1-(3) to 1-(7).

In Little and Kimura, there are no descriptions which suggest the constructional elements 7-(1) to 7-(3) and 1-(3) to 1-(7).

Since Little does not indicate that the contour of the regular N-polygonal figure can be defined by a function, nobody could introduce the features 1-(3) to 1-(7) from Little.

It appears that the examiner insists that the above-mentioned features 7-(1) to 7-(3) are suggested in the area "Rounded Square" in Little.

However, conditions shown in the area "Rounded Square", that is, Radius 1 is 60, Radius 2 is –45, Position is –101 and Resolution is 270 do not correspond to the above-mentioned features 7-(1) to 7-(3).

Additionally, in the specification of the present application, there is not a description relating to the parameter "Resolution" written in Little. It is obvious that the mechanism of the invention of the claim 7 is different from the mechanism of Little.

Therefore, it is impossible for the skilled in the art to create the invention of amended claim 7 from <u>Little</u> and <u>Kimura</u>.

<u>Independent Claim 8</u>:

In the invention of the amended claim 8, there are constructional elements as follows;

8-(1) "the said input means is constructed to carry out functions for"" setting the regular (N+1)-polygonal figure so as to define a contour which is inscribed on a circle having a radius $(N+1)^2 r$";

8-(2) "setting an angular velocity $(N+1)\omega$ at which the regular (N+1)-polygonal figure revolves";

8-(3) "said control means is constructed to carry out a function for defining a regular N-polygonal figure to be determined, which is circumscribed on a circle having a radius $N(N+2)r$, by an area being swept by the regular (N+1)-polygonal figure"; and

the above-mentioned constructional elements 1-(3) to 1-(7).

In <u>Little</u> and <u>Kimura</u>, there are <u>no</u> descriptions which suggest the constructional elements 8-(1) to 8-(3) and 1-(3) to 1-(7).

Since <u>Little</u> does <u>not</u> indicate that the contour of the regular N-polygonal figure can be defined by a function, nobody could introduce the features 1-(3) to 1-(7) from <u>Little</u>.

It seems the examiner insisted that the above-mentioned features 8-(1) to 8-(3) are suggested in the area "Rounded Square" in Little.

However, conditions shown in the area "Rounded Square", that is, Radius 1 is 60, Radius 2 is −45, Position is −101 and Resolution is 270 do not correspond to the above-mentioned features 8-(1) to 8-(3).

Additionally, in the specification of the present application, there is not a description relating to the parameter "Resolution" written in Little. It is obvious that the mechanism of the invention of the claim 8 is different from the mechanism of Little.

Kimura does not indicate a method for determining a regular N-polygonal figure by means of a regular (N+1)-polygonal figure.

Therefore, it is impossible for the skilled in the art to create the invention of amended claim 8 from Little and Kimura.

Independent Claim 9:

In the invention of the amended claim 9, there are constructional elements as follows;

9-(1) "said input means is constructed to carry out functions for" "setting a ratio of the distance between the center point and the first point to the length of a line segment, which connects the first and second points, being smaller than $(N-1)^2$";

9-(2) "said control means is constructed to carry out a function for defining a figure to be determined by the locus of the second point, which figure has vertexes of N in number, is circumscribed on a circle having a radius $N(N-2)r$, and is a single closed region formed by curves"; and

the above-mentioned constructional elements 1-(3) to 1-(7).

In Little and Kimura, there are no descriptions which suggest the constructional elements 9-(1) and 9-(2) and 1-(3) to 1-(7).

Since Little does not indicate that the contour of the regular N-polygonal figure can be defined by a function, nobody could introduce the features 1-(3) to 1-(7) from Little.

It appears that the examiner insists that the above-mentioned features 9-(1) and 9-(2) are suggested in the area "Rounded Square" in Little.

However, conditions shown in the area "Rounded Square", that is, Radius 1 is 60, Radius

2 is −45, Position is −101 and Resolution is 270 do not correspond to the above-mentioned

features 9-(1) and 9-(2).

Additionally, in the specification of the present application, there is <u>not</u> a description

relating to the parameter "Resolution" written in <u>Little</u>.   It is obvious that the mechanism of the

invention of the claim 9 is different from the mechanism of <u>Little</u>.

Therefore, it is impossible for the skilled in the art to create the invention of amended

claim 9 from <u>Little</u> and <u>Kimura</u>.

In view of the aforementioned amendments and accompanying remarks, Applicant

submits that that the claims, as herein amended, are in condition for allowance.   Applicant

requests such action at an early date.

If the Examiner believes that this application is not now in condition for allowance, the

Examiner is requested to contact Applicant's undersigned attorney to arrange for an interview to

expedite the disposition of this case.

If this paper is not timely filed, Applicant respectfully petitions for an appropriate extension of time. The fees for such an extension or any other fees that may be due with respect to this paper may be charged to Deposit Account No. 50-2866.

Respectfully submitted,

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